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SOAH CONSOLIDATED DOCKET NO. 473-19-1265

PUC CONSOLIDATED DOCKET NO. 48785

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JOINT APPLICATION OF ONCOR § BEFORE THE STATE OFFICE
ELECTRIC DELIVERY COMPANY § FILING CLERK
LLC, AEP TEXAS INC., AND LCRA §
TRANSMISSION SERVICES §
CORPORATION TO AMEND THEIR §
CERTIFICATES OF CONVENIENCE § OF
AND NECESSITY FOR 345-KV §
TRANSMISSION LINES IN PECOS, §
REEVES, AND WARD COUNTIES, §
TEXAS (SAND LAKE TO SOLSTICE §
AND BAKERSFIELD TO SOLSTICE) § ADMINISTRATIVE HEARINGS

**PRE-FILED DIRECT TESTIMONY OF MARK TURNBOUGH, PHD ON BEHALF OF
INTERVENORS MMSMITHFIELD FAMILY LIMITED PARTNERSHIP, LTD.
AND PETTUS CZAR, LTD.**

Intervenor agrees and stipulates that all parties may treat this Pre-filed Direct Testimony as though it were filed under oath.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that the foregoing document has been served and filed in the records of Docket 48785, on this 9th day of January 2019, in compliance with the PUC Procedural Rule 22.74 and the applicable Orders in the above-captioning proceedings.


Soledad M. Valenciano

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PUC CONSOLIDATED DOCKET NO. 48785**

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|--------------------------------------|----------|--------------------------------|
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| TEXAS (SAND LAKE TO SOLSTICE | § | |
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DIRECT TESTIMONY

OF

MARK TURNBOUGH, PhD

ON BEHALF OF

MMSMITHFIELD FAMILY LIMITED PARTNERSHIP, LTD.

AND PETTUS CZAR, LTD.

JANUARY 10, 2019

**DIRECT TESTIMONY OF
MARK TURNBOUGH, PhD**

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ATTACHMENT

Attachment MT-1 Resume

**DIRECT TESTIMONY OF
MARK TURNBOUGH, PhD**

I. INTRODUCTION

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Q. PLEASE STATE YOUR NAME.

A. My name is Mark Turnbough.

Q. WHAT IS YOUR OCCUPATION?

A. I am an environmental / land use and regulatory consultant.

**Q. ON WHOSE BEHALF ARE YOU PRESENTING TESTIMONY IN THIS
PROCEEDING?**

A. I am testifying on behalf of MMSMITHFIELD FAMILY LIMITED
PARTNERSHIP, LTD AND PETTUS CZAR, LTD.

**Q. PLEASE DESCRIBE THE DISCIPLINARY AREAS IN WHICH YOU
PROVIDE CONSULTING SERVICES.**

A. A significant amount of my work deals with site suitability analysis and
regulatory permitting. Most of that work is related to land use analysis, facility
permitting and compliance, environmental assessment, statistical analysis, regulatory
impact assessment, policy analysis, water resource development and multi-
disciplinary project management. Attachment MT-1 contains my resume.

**Q. HOW LONG HAVE YOU WORKED AS AN ENVIRONMENTAL
CONSULTANT?**

A. Thirty-six years.

1 **Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL**
2 **QUALIFICATIONS AS WELL AS YOUR CONSULTING EXPERIENCE.**

3 A. I received a PhD from Texas Tech University in 1985 in Systems Theory and
4 Environmental Policy. My dissertation focused on environmental resources
5 management. I have undergraduate and masters degrees from Texas Tech in
6 Anthropology/Sociology with a specialization in the statistical analysis of quantitative
7 indicators.

8 I have had significant participation in well over 150 projects. During the past
9 36 years, I have participated in the preparation of over 100 technical papers and
10 reports for clients in the public and private sectors. I am a regulatory and systems
11 consultant to Nuclear Waste Partners, LLC (NWP) which manages the DOE's Waste
12 Isolation Pilot Plant located in southeastern New Mexico. From 2007 until October
13 2014, I was also a regulatory consultant to the operator of Los Alamos National
14 Laboratory, Los Alamos National Security, LLC.

15 In the mid-1980's I participated in several transmission line projects as a
16 consultant with Espey, Huston & Associates in Austin, Texas. I worked with a multi-
17 disciplinary team, including Rob Reed, Charles Jasper, Tom VanZandt, Sandy Hicks,
18 George Vaught, and Wayne Glander, which developed a set of criteria that could be
19 applied to the evaluation of potential impacts that would result from placement of an
20 electric transmission line in any given location. These criteria included land use
21 impact variables, environmental impact variables, archaeological/historical impact
22 variables, competing electrical infrastructure variables, and esthetics considerations.

1 These criteria were adapted from environmental impact assessments conducted by
2 Espey Huston teams for various projects. They pre-date the establishment of
3 statutory requirements in PURA and the current P.U.C. Substantive Rule for siting
4 electric transmission lines. However, these criteria are widely used today as a means
5 for evaluating compliance with PURA and the P.U.C. Substantive Rule. Some of the
6 individuals on that original team have continued to do work in this area.

7 From 2004 to the present, I have been retained to evaluate proposed
8 transmission line projects in 20 PUC cases including the one pending in this matter.
9 (PUC Docket Numbers 29684, 37448, 38140, 38230, 38324, 38597, 38877, 40319,
10 40728, 41756, 41718, 42087, 42729, 43599, 43878, 44837, 46234, 48358, and
11 48625) In a recent case, PUC Docket No. 44837, which involved an AEP application
12 to route a 345-KV electric transmission line in south central Texas across remnants of
13 the Coastal Prairie, the ALJs and the PUC cited my testimony as a basis for selecting
14 an alternative route other than the one proposed by AEP and Power Engineers.

15 I continue to be very active in site selection, site suitability analysis and
16 related land use analyses for more complex non-linear siting efforts. For example, in
17 2006 I was selected by the French nuclear power company AREVA and the
18 Washington Group International (now known as AECOM URS) to manage the
19 characterization of and selection of a site for the U.S. Department of Energy's Global
20 Nuclear Energy Partnership (GNEP) that would be suitable for a Consolidated
21 Interim Storage Facility for High Level Radioactive Waste, a Spent Fuel
22 Reprocessing Facility and a Next Generation Nuclear Reactor. A suitable

1 “greenfield” site was selected and fully characterized for the GNEP in southeastern
2 New Mexico. It received the highest level of DOE funding for any of the alternatives
3 under consideration.

4 Beginning in March of 2011, I was heavily involved as the senior regulatory
5 adviser in the re-permitting of the DOE Waste Isolation Pilot Plant (WIPP), the only
6 deep geologic repository for Defense Related Transuranic Waste in the world.

7 In January of 2012, I was retained by the New Mexico State Land
8 Commission as an expert witness for the Commission in a contamination remediation
9 and ranch land restoration case (Ray Powell, Commissioner of Public Lands of the
10 State of New Mexico vs. Equity Investments Corp, et al (No. D-101-CV-2011-01285,
11 First Judicial District Court, State of New Mexico)).

12 In April of 2014, I was selected by AECOM URS, Babcock & Wilcox and
13 AREVA to be on a six person team to review and provide guidance on the Recovery
14 Plan of the DOE WIPP. The facility was shut down in February of 2014 by a
15 radiation leak caused by a drum sent by Los Alamos National Laboratory for
16 disposal. The WIPP was officially re-opened for disposal operations in January of
17 2017.

18 From 1991 to the present, I have managed or participated in the permitting of
19 over 70 percent of the total disposal capacity of Sub-Title D facilities for solid waste
20 in the state of New Mexico. In that context, my work consists of assisting applicants
21 in locating suitable sites, securing regulatory approval of those projects, and then
22 maintaining compliance with applicable regulatory frameworks.

1 I managed the application process for the first “Rule 36” facility permitted by
2 the New Mexico Oil Conservation Division (OCD) for the processing and disposal of
3 waste generated by the exploration for and production (E&P) of oil and gas. The
4 permit was issued in December of 2014, and it is the first full service facility
5 permitted under the Division’s “new” rule which was promulgated in 2008.
6 Presently, I am managing the application processes for several other OCD Rule 36
7 E&P disposal facilities and several water rights acquisition projects in southeastern
8 New Mexico.

9 In April of this year, I was retained by the Edwards Aquifer Authority (EAA)
10 to provide technical and regulatory expertise in the development of an extensive land
11 use and socioeconomic data base for Bexar, Medina and Uvalde Counties.

12 Currently I am managing the site suitability analysis and permitting of a large
13 multipurpose recycling and industrial solid waste disposal facility for Envirolands,
14 LLC in Albuquerque, New Mexico.

15 II. PURPOSE OF TESTIMONY

16 17 Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

18 A. The purpose of my testimony is to provide an evaluation of the methodology,
19 findings, and recommendations of the LCRA TRANSMISSION SERVICES
20 CORPORATION (LCRA TSC) and AEP Texas, Inc. (AEP) based on the
21 Environmental Assessment and Alternative Route Analysis (EA) conducted by Power
22 Engineers (Power) for a 345-KV Transmission Line Project (Bakersfield to Solstice)

1 in Pecos County, Texas. The proposed line is designated by ERCOT as critical to the
2 reliability of the ERCOT system. The proposed location of the study area occupies
3 the majority of north central Pecos County from just east of Reeves County to just
4 west of Crockett County. The proposed line would connect to the Bakersfield Station
5 in eastern Pecos County to the Solstice Switch Station in western Pecos County. My
6 scope of work in this case focuses on an evaluation of the alternative routes identified
7 by Power for consideration under PURA and the PUC Substantive Rule.

8 In large part my analysis is based on data provided in the LCRA TSC's and
9 AEP's Application and Power's EA supporting development of a proposed
10 transmission line and the qualities of each route as they relate to criteria established
11 by statute and Public Utility Commission ("PUC" or "Commission") rules.
12 Typically, I evaluate alternative routes in terms of the relevant statutory and
13 regulatory parameters, and in terms of how well each route would serve the
14 established need supporting development of the transmission line. My background in
15 systems engineering, regulatory consulting, and other multi-disciplinary fields
16 supporting the analysis of specific land uses is applicable to much of the work that
17 goes into these kinds of projects.

18
19 **Q. WAS YOUR TESTIMONY AND SUPPORTING DOCUMENTATION**
20 **PREPARED BY YOU OR UNDER YOUR SUPERVISION?**

21 A. Yes.

1 **Q. IS THE INFORMATION CONTAINED IN YOUR TESTIMONY AND THE**
2 **SUPPORTING DOCUMENTATION TRUE AND CORRECT TO THE BEST**
3 **OF YOUR KNOWLEDGE AND BELIEF?**

4 A. Yes.

5

6 **Q. WHY DID YOU PREPARE AN EVALUATION OF THE POWER EA AND**
7 **ROUTE ANALYSIS AND LCRA TSC / AEP'S SELECTION OF ROUTE 24**
8 **AS THE ROUTE THAT THEY BELIEVE BEST ADDRESSES THE**
9 **REQUIREMENTS OF PURA AND PUC SUBSTANTIVE RULE FOR THIS**
10 **PROJECT?**

11 A. James Spivey, an attorney with the firm SPIVEY VALENCIANO, PLLC,
12 retained me on behalf of MMSMITHFIELD FAMILY LIMITED PARTNERSHIP,
13 LTD. AND PETTUS CAZR, LTD. to evaluate the methods and results of the EA and
14 the Route Analysis used by LCRA TSC / AEP to select Route 24 as the route that was
15 thought to best meet the requirements of PURA and the PUC Substantive Rule. In
16 addition, I was asked to evaluate the potential land use and environmental impacts of
17 the primary alternative routes (Routes 1-25) relative to that determination. I was also
18 asked to evaluate the application of Power's criteria in the generation of the
19 alternative routes.

20

1 **Q. PLEASE DESCRIBE THE STEPS TAKEN TO PREPARE YOUR**
2 **EVALUATION.**

3 **A. I took the following steps:**

- 4 • The first task was to review applicable statutory and regulatory requirements
5 for development of suitable routes.
- 6 • The second task was to review LCRA TSC's / AEP's CCN Application in this
7 proceeding, including the Route Study and EA prepared by Power.
- 8 • The third task was to review LCRA TSC / AEP / Power testimony in support
9 of the CCN that would help me understand LCRA TSC's / AEP's decision to
10 select Route 24.
- 11 • The fourth task involved the evaluation of the validity of selected aspects
12 including scoping issues for the EA, the analysis that was reported in the EA,
13 and LCRA TSC's / AEP's responses to requests for information from other
14 parties.
- 15 • The fifth task involved review of testimony and comments provided by
16 interested parties regarding the decision by LCRA TSC / AEP to select Route
17 24, including Texas Parks & Wildlife comment dated December 14, 2018.
- 18 • Finally, given the information I had gathered from the preceding steps, I
19 evaluated the potential impact (in terms of requirements contained in PURA
20 and PUC Substantive Rule) on the area affected by the proposed placement of
21 Route 24.

22

23 **III. FINDINGS REGARDING LCRA TSC / AEP / POWER**
24 **ENVIRONMENTAL ASSESSMENT AND ALTERNATIVE ROUTE**
25 **ANALYSIS**

26

1 **Q. PLEASE DESCRIBE THE BASIS OF, AND METHODOLOGY DEVELOPED**
2 **FOR CONDUCTING THE EVALUATION OF THE ROUTE STUDY.**

3 A. The primary basis for evaluating the EA was to review the aerial photography
4 and mapping files and data collected and compare them to the 46 siting criteria
5 depicted in Power's Table 4-1, Land Use and Environmental Data for Primary Route
6 Evaluation Routes 10/11/2018, and Table 4-2, Land Use and Environmental Data for
7 Primary Route Evaluation (Primary Segments) and Primary Alternative Segments
8 (10/05/2018) and LCRA TSC / AEP Estimated Costs of Alternative Routes. Also, I
9 reviewed documentation (mapping and descriptions) of habitable structures within
10 500 feet of the centerline of proposed alternative routes. Further, I reviewed verbal
11 descriptions generated by Power for each segment.

12 Using those data, I compared the Land Use and Environmental Data and
13 Estimated Cost Data for Route 24 and the remaining alternative routes.

14
15 **Q. WHAT CRITERIA DID THE POWER STUDY USE TO DETERMINE THE**
16 **ROUTE THAT BEST MEETS THE REQUIRMENTS OF PURA AND PUC**
17 **SUBSTANTIVE RULE?**

18 A. As indicated above, Power used 46 criteria in order to provide comparisons of the
19 alternative routes. In many respects, these criteria systematically "operationalize" the
20 broader requirements of PUC SUBST. R. 25.101(b) (3) (i-iv) and PURA § 37.056.
21 For example, they estimate total length of the proposed routes which roughly
22 correlates to cost, if topographic changes along the proposed alignment are not

1 significant and other geotechnical issues are unremarkable. Depending on the fact
2 pattern in a given study area, it is not unreasonable to assume that arguments for the
3 protection of environmentally sensitive and/or naturally enhanced open space can be
4 compatible with concerns expressed by utilities for selecting routes that can be shorter
5 and less expensive than most of the alternatives. In this instance it can be argued that
6 protecting the environmental/natural/enhanced amenities of the overall Study Area
7 actually do correspond with a reasoned argument for selecting one of the shortest and
8 least expensive routes from among the 25 alternatives as the one that best meets the
9 requirements of PURA and the PUC Substantive Rule.

10
11 **Q. PLEASE DESCRIBE THE GENERAL CHARACTERISTICS OF THE**
12 **BAKERSFIELD TO SOLSTICE STUDY AREA.**

13 A. The Study Area for the proposed Bakersfield to Solstice Project is a 1,908
14 square mile roughly rectangular shaped polygon located in north central Pecos
15 County, Texas. The Study Area is approximately 65 miles long (along the east/west
16 axis) and 31 miles wide (along the north/south axis). It is large enough to
17 accommodate the identification of geographically diverse routes proposed to connect
18 the existing project end points. The study area was defined in order to utilize existing
19 transmission line, roadway, and railroad rights of way as well as existing land use and
20 cultural features including the Pecos County line in order to provide for the
21 delineation of an adequate number of primary alternative routes. The analysis
22 conducted by Power provides for the delineation of 25 alternative routes consisting of

1 82 primary segments. The analysis provides geographic distribution of segments /
2 alternative routes along meaningful land use features in the area.

3 According to data provided in the EA, the Study Area is situated in the
4 southern portion of the High Plains, the northwest portion of the Edward's Plateau
5 and the southeast portion of the Basin and Range Physiographic Provinces. The
6 southern High Plains is characterized as relatively flat topography with playa lakes
7 and intermittent sand dune fields with elevations that range from approximately 2200
8 feet to approximately 3800 feet above sea level. The topography of the Edwards
9 Plateau is characterized by more relief with elevations ranging from 450 feet to
10 approximately 3000 feet above sea level. The Basin and Range Region is
11 characterized by significant topographic relief with opposing mountain ranges that
12 have elevations ranging from approximately 1700 feet to 8750 feet above sea level.
13 The elevations in the Study Area range from approximately 2300 feet in the Pecos
14 River Valley that runs through the northeastern portion of the Study Area to
15 approximately 3600 feet in the southern portions of the Study Area that is
16 characterized by high mesas and some hill tops.

17 Land use in the Study Area consists primarily of irrigated agriculture,
18 ranching, and oil and gas development. According to data reported in the EA, total
19 market value for agriculture products sold out of Pecos County was approximately
20 \$47,470,000. Crop sales accounted for the majority of agricultural sales. From 2007
21 through 2012, the number of farms in Pecos County increased slightly from 287 to
22 291. Oil and gas wells were identified throughout the Study Area, however, the most

1 active and densely populated E&P activities are situated in the northern half of the
2 Study Area. There are several large ranches located in the southern portion of the
3 Study Area south of I-10 which roughly bisects the Study Area on the east/west axis.
4 The community of Fort Stockton (the County Seat of Pecos County), population
5 8,547 is the largest population center in the Study Area. It is situated on I-10 roughly
6 in the center of the Study Area.
7

8 **IV. FINDINGS REGARDING ALTERNATIVE ROUTES**
9

10 **Q. IN YOUR ANALYSIS DID YOU COMPARE OTHER ALTERNATIVE**
11 **ROUTES TO ROUTE 24 IDENTIFIED BY LCRA TSC / AEP / POWER?**

12 A. Yes.
13

14 **Q. WOULD YOU PLEASE DESCRIBE THAT COMPARISON?**

15 A. In a general sense, as previously indicated, I compared all 25 alternative
16 routes using the 46 criteria applied by Power, and using considerations unique to
17 LCRA TSC's / AEP's analysis. The results of my analysis indicate that Route 24
18 meets the requirements of PURA and PUC Substantive Rule better than the remaining
19 24 alternative routes.
20

21 **LAND USE, ENVIRONMENTAL AND**
22 **COMMUNITY VALUES CONSIDERATIONS**

1 Although the following list of attributes associated with the location of Route
2 24 consists of essentially land use or environmental characteristics, they are also a
3 reflection of a working definition of “community values” applied by PUC Staff and
4 PUC Commissioners in several dockets; “a shared appreciation of an area or other
5 natural resource by a national, regional, or local community.” In that context,
6 examples of a community resource could include a park or recreational area, a scenic
7 vista, un-fragmented open space, or historical or archaeological sites. In large part
8 the following list of characteristics represents an attempt to avoid negative impacts on
9 a shared resource:

- 10 • Route 24 has the fourth shortest total length (71.1 miles) of the 25 primary
11 alternative routes identified in the EA and Alternative Route Analysis. By
12 comparison, it is 3.3 miles longer than the shortest of the alternative routes. It
13 has been my experience that when all other considerations are roughly equal,
14 relatively shorter routes tend to create fewer opportunities for negative
15 impacts on the environment.
- 16 • Route 24 runs parallel and adjacent to existing corridors for 61.5 miles or 86
17 percent of its total length. That is the highest percentage paralleling and
18 adjacent to existing corridors for the entire set of alternative routes in the
19 Study Area. Existing corridors include public roads / highways, apparent
20 property boundaries, and existing transmission lines.

- A significant portion of the Route 24 length parallel and adjacent to an existing transmission line that is currently being reconfigured from a 69-KV to a 138-KV line will reduce the amount of new disturbance of right-of-way.
- Given the location of Route 24 along the northern edge of the Study Area from Bakersfield to Solstice, the route has relatively low perceived esthetic impact on the surrounding landscape due to the avoidance of inhabited or scenic areas.
- Route 24 has 34 recorded pipeline crossings. Pipeline crossings recorded for the other 24 alternative routes range from 20 to 46.
- Route 24 does not cross any parks, and there are no additional parks or recreational areas within 1000 feet of the ROW centerline.
- Route 24 does not cross any University Lands.
- Route 24 does not cross any NWI mapped wetlands.
- Route 24 does not cross any known habitat of federally listed threatened and endangered species.
- Route 24 does not cross open water e.g. lakes or ponds.
- Route 24 has the second fewest number of stream crossings (15).
- Route 24 does not cross any rivers.
- Route 24 does not cross any 100 year floodplain.
- Route 24 runs parallel to streams or rivers for only 0.4 mile.
- Route 24 crosses only 0.26 mile of bottomland/riparian woodlands.

- Route 24 has relatively low impact on recorded cultural resources sites: (a) crosses two recorded sites, and (b) has two additional recorded sites located within 1,000 feet of the route center line.

LCRA TSC / AEP SYSTEMS CONSIDERATIONS

- According to LCRA TSC / AEP data, Route 24 has the fourth lowest estimated cost of the 25 primary alternative routes included for consideration in the Application (approximately \$155,960,000).

PRUDENT AVOIDANCE

- Given the unusually low density of population in the northern reaches of the Study Area, Route 24 has only five habitable structures within 500 feet of the centerline for the entire length of 71.1 miles.

Q. IN YOUR EVALUATION, DID YOU REVIEW THE LETTER DATED DECEMBER 14, 2018, FROM THE TEXAS PARKS' AND WILDLIFE DEPARTMENT (TPWD) TO KAREN HUBBARD, PUC STAFF, RE: FINDINGS AND RECOMMENDATIONS FOR THIS PUC DOCKET NO.?

A. Yes.

1 **Q. PLEASE SUMMARIZE YOUR REACTION TO THE TPWD POSITION RE:**
2 **ROUTE SELECTION IN THIS CASE.**

3 A. I concur with the decision of TPWD to recommend Route 24 as having the
4 least potential impact to fish and wildlife resources.

5
6 **Q. IN CONTRAST TO YOUR OBSERVATIONS ABOUT THE**
7 **CHARACTERISTICS OF ROUTE 24, DO YOU HAVE CONCERNS ABOUT**
8 **ANY OF THE ALTERNATIVE ROUTES DELINEATED IN THE STUDY**
9 **AREA?**

10 A. Yes.

11

12 **Q. WOULD YOU IDENTIFY THE ROUTE(S) AND STATE YOUR**
13 **CONCERN(S).**

14 A. There are ten alternative routes (10, 12, 13, 14, 15, 16, 19, 21, 22 and 25) that contain
15 some combination of segments D3, J1, K1 and M1 that are of concern.

16 Segment M1, for example, significantly fragments open space on the Winfield
17 Ranch for a significant distance of approximately 4 miles on the east/west axis of the
18 property. There is no comparable or compatible linear feature that could be
19 considered a valid parallel land use. Segment M1 bisects the foothills of a very large
20 mesa without any justification.

21 Segments J1, D3 and K1 form essentially a straight line running along a
22 north/south axis for approximately 10.7 miles. These three segments in combination

1 cause significant fragmentation of additional open space on University Lands just east
2 of the Winfield Ranch. In this example, there is no apparent existing linear feature
3 that could be considered a comparable or compatible land use to justify the placement
4 of a 345-KV transmission line.

5 In both instances, substantial stretches of unencumbered open space are badly
6 fragmented without the existence of any comparable or compatible parallel land use
7 feature.

8
9 **Q. IN YOUR OPINION, WHICH OF THE 25 PRIMARY ALTERNATIVE**
10 **ROUTES BEST MEET THE REQUIREMENTS OF PURA AND THE PUC**
11 **SUBSTANTIVE RULE?**

12 A. Based on my review of the LCRA TSC / AEP CCN Application, the Power
13 EA and Alternative Route Analysis, and Testimony / Comments regarding
14 characteristics of the alternative routes, I believe Route 24 best meets the
15 requirements of PURA and the PUC Substantive Rule. Route 24 has the highest
16 percentage of its total length, 86 percent, running parallel and adjacent to existing
17 compatible corridors of the entire set of alternative routes identified in the Bakersfield
18 to Solstice project. Route 24 is the fourth shortest of the 25 alternative routes with a
19 total estimated ROW length of 71.1 miles. Route 24 is also the fourth least expensive
20 of the proposed alternatives with an estimated cost of approximately \$155,960,000.
21 The route is consistent with a sense of natural resource protection values advocated
22 by TPWD, and it also has relatively low impact on cultural resources sites. Also,

1 given the geographic distribution of structures identified along the primary alternative
2 routes, I believe that Route 24 complies with the intent of the PUC Prudent
3 Avoidance Policy.
4

5 **V. CONCLUSIONS**

6

7 **Q. WHAT CONCLUSIONS HAVE YOU DRAWN FROM YOUR ANALYSIS?**

8 A. Based on my review of the LCRA TSC / AEP Application for a CCN and the
9 supporting documents provided by Power in the EA and Alternative Route Analysis,
10 there is adequate information to reach an informed conclusion regarding the
11 suitability of the primary alternative segments and the primary alternative routes. The
12 Study Area is sufficiently large to accommodate the delineation of a geographically
13 reasonable distribution of alternative routes for connecting them. There are
14 systematic comparisons of the 25 primary alternative routes across 46 environmental,
15 socioeconomic, land use, and archaeological variables. These comparisons indicate
16 that all 25 alternative routes meet the requirements of PURA and the PUC
17 Substantive Rule. Consideration of those variables along with system considerations
18 of cost and other factors such as community values make it possible to identify Route
19 24 as relatively more suitable.
20
21
22

1 **VI. RECOMMENDATIONS**

2 **Q. WHAT IS YOUR RECOMMENDATION WITH REGARD TO ROUTE 24?**

3 A. It is my recommendation that the ALJ and the PUC Commissioners in this
4 case accept Route 24 as the route that best meets the requirements of PURA and the
5 PUC Substantive Rule.

RESUMÉ

MARK W. TURNBOUGH, PhD

January, 2019

General Background: Includes advanced multi-disciplinary education, training and experience in the analysis and synthesis of complex systems, environmental policy, technology assessment, statistical research, land-use analysis/socio-economics/demography, legislative analysis/bill drafting, drafting of regulatory language and preparation of complex permit applications for critical facilities.

Consulting Experience: Primary areas of activity include regulatory permitting/compliance monitoring, systems analysis, management of technical negotiations for legal/regulatory settlements, environmental impact assessment, site suitability analysis, site selection, site characterization, analysis of land uses, site remediation/restoration analysis, statistical research and computer applications, including Geographic Information Systems and Inductive Statistical Models.

Synopsis of Selected Consulting Activity (1984-2019):

(For complete project/work history, see Page 11, **Experience** section).

In October of 2018 was retained by the law firm of Burdett Morgan Williamson & Boykin on behalf of The Eastern Coalition to evaluate the environmental and land use impacts of a proposed LCRA Transmission Services Corporation 138-KV electric transmission line in Burleson County, Texas (Cooks Point Project). PUC Docket No. 48358.

In March of 2018 was retained by Kemp Smith Law Firm to provide technical expertise in support of Edwards Aquifer Authority litigation (Uvalde County Underground Water Conservation District, Uvalde County, City of Uvalde, et al. v. Edwards Aquifer Authority) re: complex water rights re-distribution policy.

In January of 2018 was retained by Lea Land Industrial Landfill (located at Halfway, New Mexico) to recruit and manage a multi-disciplinary team to develop an application for a major modification to the New Mexico Oil Conservation Division in order to triple the solid waste disposal capacity for Oil and Gas Exploration and Production wastes and to develop a state of the art large volume liquids recycling facility.

In May of 2017 was retained by Envirolands, LLC to identify and characterize a suitable site west of the City of Albuquerque, NM that could be permitted as a full service solid waste recycling and disposal facility under the Solid Waste Management Regulations of the New Mexico Environment Department.

In January of 2017 was retained by Straten Realty. L.L.C. (Joe Will Ross Attorney at Law) to evaluate the environmental and land use impacts of a Joint Application of AEP Texas North Company and Electric Transmission Texas, L.L.C. for the proposed AEP TNC Heartland to ETT Yellow-Jacket 138-kV Transmission Line in McColloch and Menard Counties, Texas (PUC Docket No. 46234).

In November of 2016 was retained by Synergy Medwaste, L.L.C. to provide systems and regulatory support for EPA Region 6 authorization to test and operate a high temperature pyrolysis system to treat medical waste at a location on the Nambe Pueblo near Santa Fe, New Mexico.

In September of 2016 was retained by VJ Technologies, L.L.C. to provide systems and regulatory support for the development of an integrated real time radiography inspection, remediation and re-packaging unit for managing containers of mixed Transuranic Waste that have the potential for hazardous waste incompatibility problems. **This project was initiated in order to address the Los Alamos National Laboratory (LANL) Trans-Uranic Waste shipped to WCS which was subsequently isolated in concrete modular cannisters and re-located to the federal disposal cell for safe keeping until it could be further characterized and treated on-site.**

In January 2016 was retained by Pitchfork Landfarm, L.L.C. to coordinate an assessment of potential contamination, and the development of a final closure plan for the facility located in south east Lea County, New Mexico under New Mexico Oil Conservation Rule 36.

In August of 2015 was retained by Braun and Gresham Attorneys at Law to evaluate the environmental and land use impacts of an AEP Texas Central Company Proposed Tuleta to Euler to Coletto Creek 138-kV Double Circuit Electric Transmission Line in Bee and Goliad Counties, Texas (PUC Docket No. 44837). Both the SOAH Administrative Law Judges and the PUC cited my testimony as a basis for requiring the Utility to adopt an alternative route recommended in my testimony.

In May of 2015 was retained by TVG Texas 1, LLC (Windsong Ranch Development) to evaluate the environmental and land use impacts of a proposed Brazos Electric Power Cooperative Parvin Substation and 138-kV Double Circuit Transmission Line in Collin and Denton Counties, Texas (PUC Docket No. 43878).

In May of 2015 was retained by Ewell, Brown and Blanke on behalf of Chuck Norris to evaluate the environmental and land use impacts of a proposed Centerpoint Energy 345-KV Transmission Line in Grimes, Harris and Waller Counties, Texas (PUC Docket 44547).

In February of 2015 was retained by CK Oilfield Services to conduct site suitability- site selection studies to identify land in south east New Mexico that is suitable for permitting under NMOCD Rule 36 a surface disposal facility for the treatment and disposal of oil and gas exploration waste.

In November of 2014 was retained by Brady & Hamilton to evaluate the environmental and land use impacts of a proposed Southwestern Public Service Company 240-KV Transmission Line from Wolfforth to Carlisle in Lubbock County, Texas (PUC Docket No. 42727).

In July 2014 was retained by the FFPTHC Alliance to evaluate the environmental and land use impacts of a set of routes for a 138kV electric transmission line proposed by the Lower Colorado River Authority (LCRA TSC) in, Blanco, Gillespie, and Kendall Counties, Texas (PUC Docket No. 43599) Case was not heard on the SOAH Docket until May 2015.

In April 2014 was selected by URS, Inc., B & W, Inc., and AREVA to be on a six person executive team to review and provide technical and regulatory guidance for the development of the Recovery Plan for the U.S. Department of Energy Waste Isolation Pilot Plant. The facility was shut down in February of 2014 by a radiation leak in the underground repository.

In March of 2014 was retained by the City of Haslet, Texas and the Blue Mound Alliance to evaluate the environmental and land use impacts of a set of routes for a 138kv electric transmission line proposed by ONCOR Electric Delivery Company in Denton, Tarrant and Wise Counties, Texas, PUC Docket No. 42087.

In February of 2014, was retained by Braun & Gresham, PLLC on behalf of Ray Audas, et al., Four S Investments, Henry Bethea and Jeff and Peggy Fye to evaluate an electric transmission line proposed by Entergy Texas, Inc. in Grimes and Montgomery Counties, Texas, PUC Docket No. 41718.

In January of 2014 was retained by the firm of Braun & Gresham, PLLC on behalf of Wayne "Skip" Hill, et al., Michael Bradley Nevil, and Brunhild Investments, Inc. to evaluate the TNMP CCN and route study that was used to select a route for the proposed Westminster 138 kV transmission line in Collin County, Texas, PUC Docket No.41756.

In May of 2013 was retained by Bechtel National, Inc. to provide consulting expertise on the development of a water infrastructure business unit that would serve national and international water development needs.

In November of 2012 was retained by the law firm of Ewell, Bickham and Brown, LLP on behalf of The East Wildlife Foundation in re: The San Antonio Viejo Ranch to evaluate the Recommended Route advanced by Electric Transmission Texas, LLC in its application for a 345kV double circuit Transmission Line from Rio Lobo to Rio Bravo to North Edinburg in Webb, Zapata, Jim Hogg, Brooks, Starr, and Hidalgo Counties, Texas. Was also tasked to file Cross Rebuttal Testimony in the case, PUC Docket No. 40728. Case settled on February 19, 2013 with adoption of alternate route advanced by East Wildlife Foundation and the Alliance of South Texas Ranches.

In October of 2012 was retained by Herrera & Boyle, PLLC on behalf of Bryan Herr, Tom Trial, Anthony Jennings, and John Morvant to evaluate the Application of Brazos Electric Power Cooperative, Inc. to Amend a CCN for construction of a 138kV single circuit transmission line in Grimes, Walker, and Montgomery Counties, Texas-SOAH Docket No.473-12-7019, PUC Docket No. 40319, Public Utility Commission of Texas.

From June of 2012 to October of 2016 was retained by Boston Government Services, to provide consulting services directly to the Environmental Management Division of the U.S. Department of Energy on regulatory and cross-cutting issues in the management of legacy waste at sites throughout the DOE Complex. The program is designed to provide nationally recognized expertise to the EM Division.

In January of 2012, was retained by the New Mexico State Land Office to provide technical and regulatory expertise on two unrelated tasks: (1) To evaluate the nature, extent, remediation and reclamation of surface resources affected by large scale tire dumping on State lease land, and to testify as an expert in re: New Mexico Commissioner of Public Lands v. Daniels, et al (2) To assist the Commissioner of Public Lands in evaluating the potential impact on state owned lands of proposed changes to New Mexico Oil Conservation Commission ("OCC") Rules regarding the disposition of Oil and Gas Exploration and Production wastes, and preparing a formal comment to the OCC.

In November of 2011, was retained by Gordon Environmental, Inc., Albuquerque, New Mexico, to provide site selection-site suitability expertise re: the selection of land in Sandoval County suitable for the development of a new Regional Subtitle D Landfill.

In July of 2011, was retained by the Law Firms of Lafont, Tunnel, Formby, Lafont & Hamilton, Plainview, Texas and Zach Brady & Co. on behalf of the Cogdell Ranches Trust to evaluate and prepare direct testimony as an expert before the Texas PUC re: the Application of Southwestern Public Service Company to Amend a Certificate of Convenience and Necessity for a Proposed 345kV Electric Transmission Line within Hale, Floyd, Motley, Cottle, Briscoe, Hall, Childress, Donley, Collingsworth, and Wheeler Counties, Texas (SOAH Docket No. 473-11-5978, PUC Docket No. 38877 Public Utility Commission of Texas) that would cross nine of the Cogdell ranches in the Panhandle of Texas.

In June of 2011, was retained by Robert Hall, Oklahoma City, Oklahoma to oversee resolution of compliance issues between Lea Land Industrial Landfill and the New Mexico Environment Department.

In March of 2011, was retained by the Lea County, New Mexico Economic Development Corporation to prepare an application to the New Mexico Environment Department for a "Voluntary Remediation Program/Covenant Not To Sue" on behalf of International Isotopes, Inc.

In January of 2011, was retained by the Law Firm of Stubbeman, McRae, Sealy, Laughlin & Browder on behalf of John B. Phillips, Skipper Driver, and Dane Driver to evaluate selected links in the Wind Energy Transmission Texas, LLC proposed Long Draw to Sand Bluff to Divide and Sand Bluff to Bearkat 345 kV CREZ Transmission Lines in Borden, Coke, Glasscock, Howard, Mitchell, & Sterling Counties (SOAH Docket No. 473-11-1266, PUC Docket No. 38825).

In November of 2010, was retained by Big Bear Disposal, Lovington, New Mexico to evaluate the suitability of sites in southeastern New Mexico for the development of proposed Oil and Gas Waste Disposal Facilities.

In October of 2010, was retained by the Lea County, New Mexico Economic Development Corporation to validate site suitability for two tracts of land west of Hobbs, New Mexico for the location of two facilities: one (640 acres) that would De-convert Depleted Uranium Hexafluoride, and the other (1000 acres) for a facility that would utilize a patented recombinant organism, brine-water and carbon dioxide in a large array of photosensitive panels to produce diesel products and related molecular chains.

In August of 2010, was retained by Law Firm of Herrera & Boyle on behalf of Group of Allied Landowners to evaluate selected links in the amended ONCOR Willow Creek-Hicks 345-kV CCN for a CREZ Transmission Line in Denton, Parker, Tarrant and Wise Counties (SOAH Docket No. 473-10-4789, PUC Docket No. 38324).

In July of 2010, was retained by Law Firm of Herrera & Boyle on behalf of the Ioni Creek Conservation Group to evaluate selected links in the Lone Star Central A to Central B to Sam Switch to Navarro 345-kV CCN Route Analysis (SOAH Docket No.473-10-4398, PUC Docket No. 38230).

In May of 2010, was retained by Law Firm of Herrera & Boyle on behalf of Clear Creek Preservation Coalition to evaluate selected links in the ONCOR Riley-Krum 345-kV CCN Route Study and Environmental Assessment (SOAH Docket No.473-10-4109, PUC Docket No. 38140).

In December of 2009, was retained by Law Firm of Locke, Lord, Bissell and Lydell on behalf of CJ Ranch, Garrett Ranch, Point Peak Resort and Jean Mueller to evaluate alternatives to LCRA's proposed 345-kV transmission line from Gillespie –Newton (PUC Docket No. 37448)

In July of 2009, was retained by Hicks & Co. to evaluate the environmental impacts of alternative routes for a Lower Colorado River Authority (LCRA) electric transmission line that would run from Dallas to Kendall County, Texas.

In August of 2008, was retained by Waste Connections, Inc. to characterize and acquire land from the New Mexico Commissioner of Public Lands that would be suitable for permitting under 20.9.1 NMAC for a Subtitle D solid waste disposal facility in Otero County, New Mexico.

In August of 2008, was retained by The Urlacher Group (Big Bear Disposal, Inc.) to site, characterize, permit and oversee construction of an Oilfield disposal system under Rule 36 of the Oil Conservation Commission Regulations.

From February of 2008 to October 2011, was retained by Project Enhancement Corporation (PEC) to provide regulatory expertise to the Environmental Management Division of DOE re: Cross-cutting issues with the potential to affect multiple sites in the complex.

From January 2008 to October 2014, was retained by Los Alamos National Security (LANS) to provide regulatory guidance to LANS and NNSA re: implementation of the Los Alamos RCRA Order on Consent signed by the state of New Mexico, DOE and LANS.

In December 2007, coordinated the legal/technical case and testified for the applicant in the New Mexico Environment Department's adjudicatory permit hearing for Camino Real Landfill in Sunland Park, New Mexico.

In August 2007, was retained by the Lea County Energy Committee / Lea County Economic Development Corporation to characterize the suitability of several selected sites for construction and operation of a Uranium Enrichment Facility. A separate entity, International Isotopes has selected one of those sites for a de-conversion plant.

In January 2007, was retained by the Eddy-Lea Energy Alliance, LLC (ELEA), The Washington Group and AREVA as Principal Site Investigator for the proposed ELEA Global Nuclear Energy Partnership (GNEP) Site Characterization effort for a Consolidated Fuel Reprocessing Facility and an Advanced Burner Reactor.

In December 2007, was retained by Sundance Oilfield Services, LLC to develop an application under new Oil Conservation Division regulations (Rule 36) for solid waste disposal facilities near Eunice, New Mexico.

In October 2006, was retained by Ben Barnes & Associates to evaluate RCRA compliance issues for the Lea Land Industrial Waste Disposal Facility in Lea County, New Mexico.

In May 2006, was retained by the City of Clayton, New Mexico to locate, characterize, acquire and permit a suitable site for a regional landfill for northeast New Mexico and northwest Texas.

In April 2006, was retained by Gordon Environmental, Inc. for Southwest Landfill to evaluate the relationship between the existing facility and land uses in the surrounding area.

In April 2006, was retained by a private consortium representing Lea and Eddy Counties (ELEA), New Mexico to manage the preparation of a site proposal to the DOE (Global Nuclear Energy Partnership-GNEP) request for proposals to identify a suitable site for a proposed spent nuclear fuel recycling facility. After GNEP the ELEA has purchased the proposed site for other economic development purposes.

From January 2006 to the present, has been retained as a consultant by Las Uvas Dairies, Hatch, New Mexico (one of the largest family owned dairy operations in the United States) to provide regulatory assistance to its facility engineers regarding the renewal and compliance maintenance of its consolidated discharge permits issued by the state of New Mexico.

From March 2005 to March 2006, drafted sections for the Camino Real Solid Waste permit application and provided quality assurance review of the entire submission. The application package was submitted to the New Mexico Environment Department Solid Waste Bureau on March 6, 2006.

From October 2005 to March 2006, coordinated independent third party preparation of Community Impact Assessments (CIA) for Camino Real Landfill (Sunland Park, N.M.) and the proposed Rhino Landfill (Chaparral, N.M.). The studies were prepared as part of the permitting process for both facilities.

As consultant to Camino Real Landfill in Sunland Park, New Mexico, participated in the preparation and submission of the Title V Operating Permit renewal application. The application was submitted to the New Mexico Environment Department (NMED) on April 29, 2005 and was subsequently approved and the permit was re-issued.

As consultant to Sandoval County (New Mexico), participated in the preparation of a RCRA Subtitle D Application for a major expansion of regional landfill and recycling facility. (April 2004-June 2005). Facility permitted on July 17, 2005.

As consultant to Controlled Recovery, Inc. (CRI), provided regulatory expertise to large scale oil recycling operation in Lea County New Mexico (April, 2005-January 2007).

As consultant to WCI, Inc., negotiated settlement of NMED Administrative Order against El Paso Disposal, Inc. (a subsidiary of WCI, Inc.) (October-December, 2004).

As consultant to Carroll, Gross, Reeder & Drews, LLP provided expertise on behalf of Lawrence and Carolyn Biedenharn in re: a 138kV electric transmission line proposed by the Lower Colorado River Authority ("LCRA") Transmission Services in Kendall and Bexar Counties (SOAH Docket No. 473-04-7609, PUC Docket No. 29684, Public Utility Commission of Texas) July, 2004-July, 2005.

As consultant to CH2M HILL, provided specialized regulatory and project development expertise (January 2004-December 2009).

As consultant to Advanced Technologies and Laboratories International, Inc. (ATL) provided regulatory expertise to U. S. Department of Energy Headquarters Environmental Management

Division (EM3) for the definition and resolution of major regulatory problems for DOE facilities, e.g. LANL Consent Order, Hanford TRU Tank Waste and Fernald Silos Waste (April 2004-2009).

As consultant to Nuclear Waste Partners (Formerly the Washington Group International) provides specialized regulatory consulting for the Washington Group at the U.S. Department of Energy WIPP facility in the state of New Mexico (January 2004-present).

As consultant to the LES/URENCO National Enrichment Facility (NEF), provided specialized regulatory consulting for the acquisition of environmental permits from the state of New Mexico (January 2002-July 2009).

As consultant to Aquila / Canberra, Inc. provided specialized regulatory and policy analyses for ongoing North American projects (July 2003-2006).

As consultant to the New Mexico State Land Office drafted policy guidance for enhancing the protection of surface resources on land owned by the State of New Mexico (June 2003-July 2004).

As consultant to Cogema (AREVA), Inc. conducted regulatory and technical feasibility studies for a range of potential North American projects (September 2002-2003).

As consultant to American 3CI, provided regulatory expertise on the preparation of permits for infectious waste management facilities (February 2002-March 2006).

As consultant to CTAC, provided regulatory expertise on the modification of the U.S. Department of Energy (DOE) /WIPP hazardous waste permit issued by the State of New Mexico (January 2002-January, 2004).

As consultant to Moncrief Oil Company, provided specialized regulatory guidance on the disposition of sulfur and related by-products of natural gas processing facilities in the Wind River Basin of central Wyoming (August 2001-August 2002).

As consultant to Westinghouse/TRU Solutions and Westinghouse Safety Management Solutions, provided regulatory expertise on the modification of the U.S. DOE/WIPP hazardous waste permit issued by the state of New Mexico (September 2000-December 2001).

As consultant to the Edwards Aquifer Authority (contracted through Kemp Smith, P.C. and Hicks and Co.) provided regulatory analysis for the development of and impact assessment for new aquifer management rules (June 2000-December 2009).

As environmental consultant to CRI, Inc. provided regulatory expertise; client was in opposition to a proposal by the state of New Mexico to co-mingle oilfield wastes with solid waste (sub-title D) in disposal cells permitted for sub-title D wastes (Jan.-Nov., 2000). NMED hearing officer adopted Mr. Turnbough's interpretation of the regulatory framework. It was the first time an NMED hearing officer had ever ruled against an established NMED policy.

As consultant to the Washington Group assisted in the development of a community interface plan to improve the company's relationship with Lea County, New Mexico (July-September, 2000).

As consultant to the Washington Group, provided permit and license data regarding WCS capabilities to store and characterize TRU waste in support of the WIPP project (February- April, 2000).

As environmental consultant to Lea County, New Mexico provided interface with U.S. Department of Energy (DOE) in preliminary discussions regarding economic development associated with the operation of the DOE Waste Isolation Pilot Plant (WIPP) (1999-2000).

As environmental consultant to Raymond G. Sanchez and Robert Desiderio, attorneys at law, provided project management and coordination for site assessments on Maloof properties in New Mexico (January 2000-December 2001).

As environmental consultant to the El Paso, Texas based law firm of Kemp Smith, provided expertise for the selection and development of water resources for use by the City of El Paso (2000-2005).

As environmental consultant to Spivey & Ainsworth and Chandler and Associates, provided expertise on the assessment of a large and complex oilfield contamination case (Cantrell v. Ashland Oil Co.) in Johnson and Lawrence Counties, Kentucky (1999-2009).

As lead consultant on the Lea County Landfill project managed site selection studies and permit document preparation for submission to the New Mexico Environment Department (Permit granted 1999).

As environmental consultant to WCS, LLC provided regulatory guidance for the development of permits and licenses for additional radioactive and hazardous waste streams for the facility. Provided systems support and compliance monitoring at facility permitted and licensed in Texas. Also, managed compliance issues with regulatory agencies in New Mexico re: potential discharges from WCS to "a downstream receiving state." (WCS is located adjacent to the Texas/New Mexico state line). (June 1995-2016).

As environmental consultant to Harlan Richey (President of Richey Oil Co.), provided expertise and expert testimony; client was in opposition to a proposed 27,000 acre sludge application project adjacent to the historic Eagle Mountain Ranch in Hudspeth County, Texas. The Texas Natural Resources Conservation Commission (TNRCC) subsequently withdrew its prior approval of the project (1997-1998).

As environmental consultant to Phillips Petroleum, Inc., provided expertise and expert witness testimony (deposition only—case was settled in favor of Phillips) on a complex land use/ groundwater contamination case (1997-1998).

As environmental consultant/project manager to Camino Real Environmental Center (CREC), managed the development of three solid waste permit applications for boundary modification, recycling center and landfill permit renewal for the solid waste facility at Sunland Park, (Doña Ana County) New Mexico. (Permits granted 1997). Coordinated Title V and NSPS permitting and related compliance issues at the all of the subsidiary facilities in New Mexico (1990-2006). Provided regulatory guidance for early phases of solid waste permit application preparation for 2007 hearing. Compliance monitoring (2004-2012).

As environmental consultant/project manager for USA/UNITED WASTE, coordinated the rehabilitation of a permit (solid waste) application for Tri-Sect Landfill in Valencia County, New Mexico. (1998)

As environmental consultant/project manager for CREC, managed the acquisition of a discharge permit for a sludge land application site at the CREC Sunland Park, New Mexico site. (1994)

As environmental consultant/project manager for CREC, managed the site selection and development of a permit application for the Eddy County, New Mexico regional landfill (Sand Point Regional Landfill). (Permit granted 1994)

As environmental consultant/project manager for Med-Compliance Services (MCS), managed the development of a permit application for a bio-medical waste transfer and processing facility in Albuquerque (Bernalillo County) New Mexico. (Permit granted 1994).
Project required the development of a new processing technology that could meet new state standards.

As environmental consultant to Lower Valley Water District (El Paso County), prepared environmental assessments for Las Azaleas constructed wetlands project. (1993).

As permit consultant to R.R.I., acquired landfill and recycling permits for R.R.I. (NUMEX Landfill) facilities at Sunland Park, New Mexico. (1991).

As project manager for El Paso County, (El Paso County v. State of Texas), coordinated 4 year review of Ft. Hancock site suitability for radioactive waste disposal. Developed technical case for plaintiffs. Plaintiffs prevailed on all 25 factual issues. District court decision upheld plaintiffs. State did not appeal. (1988-1991).

As Director of Special Projects (consulting position) at the Rio Grande Council of Governments, El Paso, Texas responsibilities included development and management of multi-disciplinary projects that focused primarily on land use and site planning issues in the region, e.g., site selection for landfills, industrial parks, experimental energy storage systems, etc., (1989).

As Principal Planner at Sub-Land, Inc. El Paso, Texas responsibilities included management of environmental and economic feasibility studies for large-scale land use projects. (1986-1987).

As a Senior Staff Policy Analyst/Planner at EH & A Environmental Consultants, Austin, Texas was responsible for the design and implementation of land use, environmental/economic baseline and impact studies and other assessments. Also was responsible for various types of specialized studies (regulatory, budgeting and forecasting). Developed and managed computer-based models for environmental planning, e.g. riverine flow impacts on bays and estuaries, predictive models for archeological resources in large scale surveys. (1984-1987).

Expert Witness Experience: Federal and State Court; Regulatory Hearings. (Primary areas – permitting, environmental assessment, environmental remediation/restoration, land use analysis, solid waste facility regulations, municipal services assessment and redistricting). Expert testimony in Administrative/Regulatory Hearings on environmental/land use issues, e.g. RCRA permits, air quality permits, routing of electric transmission lines and water plans.

Academic Experience: Taught courses in systems analysis, site planning, land use management, environmental policy, alternative energy resource investigations, organization theory, industrial expansion analysis, policy typology assessment, public budgeting fiscal planning, anthropology and quantitative sociology.

Experience/Work History:

(Note: Several activities have overlapping/ concurring time frames)

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| Environmental Consultant | Burdett Morgan Williamson & Boykin Amarillo, Texas October 2018-January 2019 |
| Systems/Regulatory Consultant | Kemp Smith Law Firm Austin, El Paso, San Antonio, Texas March 2018 - Present |
| Regulatory Consultant | Lea Land, L.L.C. Oklahoma City January 2018-Present |
| Environmental/Regulatory Consultant | Envirolands, L.L.C. Albuquerque, NM May 2017 – Present |

**Environmental/Regulatory
Consultant**

Staten Realty, L.L.C.
Brady, Texas
January 2017 – Present

**Systems/Regulatory
Consultant**

Synergy Medwaste, L.L.C.
Dallas, Texas
November 2016 – Present

**Systems/Regulatory
Consultant**

VJ Technologies
Bohemia, New York
September 2016 - Present

**Environmental/Regulatory
Consultant**

Pitchfork Landfarm, L.L.C.
Jal, New Mexico
January 2016 - Present

**Environmental/Land Use
Consultant**

Braun & Gresham, Attorneys at Law
on Behalf of the Coastal Prairie Alliance
Austin, Texas
August 2015- Present

**Environmental/Land Use
Consultant**

TVG Texas 1, LLC (Windsong Ranch
Development) Prosper, Texas
May – September, 2015

**Environmental/Land Use
Consultant**

Ewell, Brown & Blanke, Chuck Norris
Austin, Houston, Texas
May 2015-July 2015

**Site Selection, Oil and Gas
Waste Disposal Permitting
Consultant**

CK Environmental Services
Portland Oregon
February 2015

**Environmental/Land Use
Consultant**

Brady & Hamilton
Lubbock, Texas
November 2014-May 2015

**Environmental/Land Use
Consultant**

FFPTHC Alliance
Fredricksburg, Texas
July 2014 through May 2015

**Environmental/Land Use
Consultant**

City of Haslet, Texas
March through July 2014

**Environmental/Land Use
Consultant**

Braun & Gresham, PLLC
Austin, Texas
January 2014 through Present

Water Resource Consultant

Bechtel National, Inc.
Michael Graham Sr. VP Reston, VA
May 2013 to May 2014

**Environmental/Land Use
Consultant**

Ewell, Brown, and Blanke, LLP
Austin, Texas
November 2012 to February 2013

**Environmental/Land Use
Consultant**

Herrera & Boyle, PLCC
Austin, Texas
October to December 2012

Regulatory Consultant

Boston Government Services, LLC
Lenoir City, TN
June 2011 to May 2015

Environmental Consultant:

New Mexico State Land Office
SLO v. Daniels, et al/ Pit Rule Amendments
Santa Fe, New Mexico
January 2012 to October 2014

Environmental Consultant:

Gordon Environmental, Inc.
Sandoval County Landfill
Albuquerque, New Mexico
November 2011 to the present

Environmental Consultant:

Lafont, Tunnel, Formby, et al
On behalf of Cogdell Trust
Plainview, Texas
August 2011 to September 2011

**Environmental Consultant/
Regulatory Compliance:**

Robert Hall
Oklahoma City, Oklahoma
June 2011 to the present

**Environmental Consultant/
Regulatory Compliance:**

Lea County Economic Development Corp
Lea County, New Mexico
March 2011 to September 2011

**Environmental Consultant/
Utility CCN Review:**

Stubbeman, McRae, Sealy, Laughlin &
Browder, LLC
Midland, Texas
January 2011 to March 2011

**Environmental Consultant/
Site Suitability Assessment:**

Big Bear Disposal Disposal
Lovington, New Mexico
November 2010 to November 2012

**Environmental Consultant/
Site Suitability Assessment:**

Lea County Economic Development Corp,
New Mexico
October 2010 to March 2011

**Environmental Consultant/
Utility CCN Review:**

Herrera & Boyle, PLLC
Austin, Texas
May 2010 to December 2010

**Environmental Consultant/
Utility CCN Review:**

Locke, Lord, Bissell and Lydell, PLLC
Austin, Texas
December 2009 to March 2010

Environmental Consultant:

Hicks & Co.
Austin, Texas
July 2009

Land Acquisition/

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| Permitting Consultant: | Waste Connections, Inc Houston, Texas August 2008 to October 2012 |
| Permitting Consultant: | The Urlacher Group Doing Business as DNCS Phoenix, AZ August 2008 to 2015 |
| Regulatory Consultant: | Project Enhancement Consultants Germantown, Maryland February 2008 to October 2011 |
| Regulatory Consultant: | Los Alamos National Security, LLC Los Alamos National Laboratory January 2008 to October 2014 |
| Project Manager: | Waste Connections, Inc. (Houston, Tx) Adjudicatory Permit Hearing for Camino Real Landfill (Sunland Park, NM) December 2007 (30 day hearing) |
| Site Suitability Consultant: | Lea County, New Mexico Nuclear Facility Sites Hobbs, New Mexico August 2007 to January 2015 |
| Principal Site Investigator: | Eddy-Lea Energy Alliance, WGI, AREVA Global Nuclear Energy Partnership Site Characterization for Spent Fuel Reprocessing Facility and ABR Carlsbad, NM January 2007 to July 2009 |
| Permitting Consultant: | Sundance Oilfield Services, Eunice, New Mexico December 2006-November 2012 |
| Regulatory Consultant: | Ben Barnes & Associates, Austin, Texas October 2006-October 2008 |

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| Land Use/ Regulatory Consultant: | City of Clayton, New Mexico May 2006-January 2007 |
| Land Use Consultant: | Lea/Eddy County GNEP Proposal Hobbs/Carlsbad, New Mexico, April 2006-2009 |
| Land Use Consultant: | Southwest Landfill Albuquerque, New Mexico February, 2006-July 2006 |
| Regulatory Consultant: | Las Uvas Dairies Hatch, New Mexico January 2006-present |
| Environmental Consultant/ Utility CCN Review: | Carroll, Gross, Reeder & Drews, L.L.P. Austin, Texas, July 2004-July 2005 |
| Systems and Environmental Consultant: | CH2M Hill, Inc., Albuquerque, New Mexico August 2004-December 2009 |
| Regulatory Consultant: | Advanced Technologies and Laboratories, International, Inc. Germantown, Maryland, April 2004-2007 |
| Regulatory Consultant: | Nuclear Waste Partners, LLC Carlsbad, New Mexico U. S. Dept of Energy WIPP Facility January 2004-present |
| Regulatory Consultant: | National Enrichment Facility Albuquerque, New Mexico January, 2000 –January 2009 |
| Policy Consultant: | Aquila/Canberra, Inc. Albuquerque, New Mexico July, 2003 - 2006 |
| Land Use Consultant: | New Mexico State Land Office Santa Fe, New Mexico June 2003- July 2005 |

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| Regulatory Consultant: | Cogema, Inc. Bethesda, Maryland August, 2002 - 2003 |
| Regulatory Impact Consultant: | Hicks & Co. Austin, Texas January, 2002-2009 |
| Regulatory Consultant: | American 3CI Dallas, Texas February 2002-March 2004 |
| Regulatory Consultant: | CTAC Technical Assistance Carlsbad, New Mexico U.S. DOE/WIPP Site January 2002-2003 |
| Regulatory Consultant: | Moncrief Oil Company Fort Worth, Texas Wind River Basin Wyoming August 2001-2003 |
| Regulatory Impact Consultant: | Edwards Aquifer Authority San Antonio, Texas June 2000-2009 |
| RCRA Permit Consultant: (Sub-title C) | Westinghouse / U.S. Dept. of Energy WIPP Facility Carlsbad, New Mexico September 2000-December 2001 |
| Expert Witness (remediation): | Bramblett & Bramblett El Paso Texas 2000-2001 |
| Environmental Consultant: (Regulatory Compliance) | CRI, Inc. Hobbs, New Mexico January 2000-2006 |
| Environmental Consultant: (Site Assessment) | Raymond G. Sanchez and Bob Desiderio Attorneys at Law Albuquerque, New Mexico February, 2000-February 2001 |

**Environmental Consultant:
(Water Development Strategy)**

Kemp- Smith Law Firm
El Paso, Texas
February, 2000-2006

**Environmental Consultant:
(DOE Policy)**

Lea County, New Mexico
1999- April 2000

**Environmental Consultant:
(Oilfield Contamination
Assessment-Expert Witness)**

Chandler and Associates, Lufkin, Tx
Spivey & Ainsworth, Austin, Tx
In Re: Martha Oilfield (Paintsville, Kentucky)
July, 1998-2009

**Environmental Consultant:
(Oilfield Contamination
Assessment-
Expert Witness)**

Phillips Petroleum
Borger Refinery (Tx)
Bartlesville, Oklahoma
1997-1998

**Environmental Consultant:
(Surface Water Protection-
Expert Witness)**

Richey Oil Company
Tyler, Texas
(Hudspeth Co. Texas) 1997-1998

**Environmental Consultant:
(Remediation Estimates-
Expert Witness)**

“Triangl” (sic) Equities
El Paso, Texas
1997-1998

**Environmental Consultant:
(RCRA/RAD Regulation)
DOE Interface**

Waste Control Specialists, LLC.
Dallas, Texas/
Pasadena, Texas 1995-2016

**Environmental Consultant:
(Land Use Analysis)**

Santa Teresa Development, Inc.
February, 1986 to 1994

**Environmental Consultant:
(Landfill Evaluation)**

El Paso County Commissioner's Court
El Paso, Texas
1989 to 1991

**Environmental Permit Consultant:

(Landfill Site Selection, Permitting)**

R.R.I. (Waste Disposal)
El Paso, Texas
June 1990-2012
(Purchased in 1999 by Waste Connections,
Inc.)

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| Biomedical Waste Technology Development: (Regulatory Consultant) | Med-Compliance Services El Paso, Texas February, 1991-1999 |
| Environmental Consultant: (Land Use) | Horizon Environmental Services Austin, Texas 1995-1996 |
| Director, Environmental Projects: | Rio Grande Council of Governments El Paso, Texas March 1987-July, 1989 |
| Professor: (Adjunct) | New Mexico State University Land Use Analysis Las Cruces, New Mexico 1988 |
| Principal Planner | Sub-Land, Inc. El Paso, Texas 1986-1987 |
| Senior Policy Analyst / Land Use Analyst: | Espey, Huston & Associates, Inc Austin, Texas 1984-1986 |
| Division Chairman: (Interim) | Social Sciences Wayland University Plainview, Texas 1983 |
| Lecturer - Budgeting and Forecasting: | MPA Program, Texas Tech University Lubbock, Texas 1983 |
| Research Associate: | Center for Energy Research Texas Tech University Lubbock, Texas 1979 |
| Lecturer - Technology Assessment: | Department of Industrial and Systems Engineering (Doctoral Program) Texas Tech University Lubbock, Texas 1979 |

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| Assistant Division Chairman: | Public Administration/Systems Wayland University Plainview, Texas 1978-1983 |
| Administrative Head/Interim Director: | Computer Services Wayland College Plainview, Texas 1976-1978 |
| Instructor - Public Policy: | Department of Political Science Texas Tech University Lubbock, Texas 1976 |
| Assistant to City Manager: | City of Plainview, Texas 1976 |
| Research Assistant, Stochastic Models: | Frederick Hartmann, Alfred Thayer Mahan Professor of Maritime Strategy Naval War College 1974-1975 |
| Instructor- Department of Anthropology: | Department of Anthropology Wayland College Plainview, Texas 1971-1974 |
| Research Assistant: | Department of Anthropology/Sociology Texas Tech University Lubbock, Texas 1970-1971 |
| Technical Writer: | Litton Industries Lubbock, Texas 1969 |

Education: (Major Fields)

- PhD:** Systems Theory (Industrial Eng) and Environmental Policy (Public Admin)
Dissertation Topic – Typological Constructs
(Environmental Policy Issue—Environmental Resources Management)
Texas Tech University
Lubbock, Texas
August, 1985
- MA:** Anthropology/ Sociology/ Public Policy Analysis
Thesis Topic – Ideal Typology Development
Texas Tech University
Lubbock, Texas
1971
- BA:** Anthropology / Biology / Journalism
Texas Tech University
Lubbock, Texas 1969

Advisory Committees:

New Mexico Environment Department, Draft Dairy Regulation Advisory Committee, June 2009 to January 2011/2014-2016.

New Mexico Environment Department, Environmental Justice Planning Committee, December, 2003 to 2006.

New Mexico Governor-Elect Bill Richardson Transition Team Chairman (Tri-Chair) for the New Mexico Environment Department, November 14, 2002 to January 31, 2003.

New Mexico Environment Department Radioactive Materials Fees Advisory Committee (Waste Management and Disposal Industry Representative), May 1, 2000 to December 31, 2003.

USEPA Environmental Justice Advisory Council/ SWANA-- Waste Transfer Station Working Group, 1999 to May, 2001

New Mexico Environment Department, Tire Recycling Advisory Committee, 1995-1996

New Mexico Environment Department, Solid Waste Regulations Revision Advisory Committee, August - December, 1993

Rio Grande Council of Governments, Regional Solid Waste Management Plan (Far West Texas Planning Region), 1993

El Paso City/County Consolidated Data Processing Advisory Board - Oversight of computer operations for consolidated system, 1989 - 1991

Awards:

Solid Waste Association of North America—(Camino Real) Landfill Excellence Award for Best Landfill Operation in North America, 1997 (Coordinated effort for facility operation and evaluation).

Outstanding Contribution Award - Environmental Design Contest, Waste Education Research Consortium, (Los Alamos National Laboratory, Sandia National Laboratory, University of New Mexico, New Mexico Tech, New Mexico State University and U.S. Department of Energy) May, 1993.

Outstanding Graduate Student Teacher of the Year, Texas Tech University, 1976.

George Mahon Congressional Scholarship Award for Graduate Study of Public Policy, 1974-1975.

Joint Graduate Student/Graduate Faculty Research Grant, "Development of Dis-aggregative Analysis for Decomposition of Large Data Sets", Texas Tech University, 1974.

Technical Reports/Papers/ Pre-Filed Direct Testimony and Related Documents:

Note: All of the Espey-Huston (EH&A) reports and all of the regulatory assessments prepared for the Edwards Aquifer Authority were prepared in collaboration with multi-disciplinary teams of experts. Many of the documents listed here are proprietary and confidential and cannot be released for review. All of the PUC pre-filed testimony listed here is, however, publicly available and can be located on the Texas PUC Interchange.

Pre-filed Direct Testimony in re: Application of LCRA Transmission Services Corporation to Amend a Certificate of Convenience and Necessity for the Cooks Point 138-kV Transmission Line in Burleson County, Texas (PUC Docket No. 48358, January 10, 2019)

Pre-filed direct Testimony in re: Application of AEP Texas North Company and Electric Transmission Texas, L.L.C. for the proposed AEP TNC Heartland to ETT Yellow Jacket 138kV Transmission Line McCulloch and Menard Counties, Texas (PUC Docket No. 46234, January, 2017)

Pre-filed Direct Testimony in re: Application of AEP Texas Central Company for a Certificate of Convenience and Necessity for the Tuleta to Euler to Coletto Creek Double Circuit 138-KV Transmission Line in Bee and Goliad Counties, Texas prepared for the Coastal Prairie Alliance (PUC Docket No.44837),

December 7, 2015. SOAH Administrative Law Judges cited my testimony in their ruling to require the Utility to adopt an alternative route described in my testimony as the route that best met the requirements of PURA and the Substantive Rule. The PUC adopted the ALJ's findings in their final decision.

Pre-filed Direct Testimony in re: Application of Centerpoint Energy Houston Electric, L.L.C. to Amend a Certificate of Convenience and Necessity for a Proposed 345-KV Transmission Line Within Grimes, Harris, and Waller Counties, Texas prepared for Concerned Property Owners Alliance (PUC Docket No. 44547) July 13, 2015.

Pre-filed Direct and Rebuttal Testimony in re: Application of Brazos Electric Power Cooperative Certificate of Convenience and Necessity for the Proposed Parvin Substation and a Double Circuit Transmission Line in Collin and Denton Counties, Texas prepared for TVG Texas 1, L.L.C. (Windsong Ranch Development) (PUC Docket No. 43878). June 22, 2015 and August 7, 2015

Pre-filed Direct and Rebuttal Testimony in re: Application of Lower Colorado River Authority (LCRA TSC) for a Double Circuit Transmission Line in Blanco, Gillespie, and Kendall Counties, Texas (Luckenbach Case) prepared for the FFPTHC Alliance (PUC Docket No.43599). April 6, 2015 and May 5, 2015.

Pre-filed Direct Testimony in re: Application of Southwestern Public Service Company to Amend its Certificate of Convenience and Necessity for a Proposed 240-KV Transmission Line Within Lubbock County (Wolfforth to Carlisle) PUC Docket No. 42729) January 9, 2015.

Pre-filed Direct Testimony in re: Proposed Amendment to 20.6.6 NMAC (Dairy Rule) before the State of New Mexico Water Quality Control Commission on behalf of DIGCE, No.WQCC 13-08(R), November 2014.

Pre-filed Direct Testimony in re: Application of ONCOR Electric Delivery Company for Application for a Certificate of Convenience and Necessity for a Proposed Electric Transmission Line in Denton, Tarrant and Wise Counties, Texas prepared for the City of Haslet and the Blue Mound Alliance (PUC Docket No. 42087) June 9, 2014.

Pre-filed Direct Testimony in re: Application of Entergy Texas, Inc. for Application for a Certificate of Convenience and Necessity for a Proposed Transmission Line in Grimes and Montgomery Counties prepared for the Law Firm of Gresham & Braun, PLLC on behalf of Ray L. Audas, et al., Four S Investments, Henry Bethea and Jeff and Peggy Fye (SOAH Docket No. 473-14-0551, PUC Docket No. 41718) March 25, 2014.

Pre-filed Direct Testimony in re: Application of Texas-New Mexico Power Company to Amend its Certificate of Convenience and Necessity for the Proposed Westminster 138kV Transmission Line in Collin County, Texas prepared for the Law Firm of Braun & Gresham on behalf of Wayne "Skip" Hill, et al., Michael Bradley Nevil and Brunhild Investment, Inc. (SOAH Docket No.473-14-0807, PUC Docket No. 41756) February 13, 2014.

Pre-Filed Cross Rebuttal Testimony in re: Application of Electric Transmission Texas, LLC to Amend its Certificate of Convenience and Necessity for the Proposed Rio Lobo to Rio Bravo to North Edinburg 345 kV Double Circuit Transmission Line in Webb, Zapata, Jim Hogg, Brooks, Starr, and Hidalgo Counties, Texas prepared for the Law Firm of Ewell, Bickham, and Brown on behalf of The East Wildlife Foundation (SOAH Docket No. 473-13-0846, PUC Docket No. 40728) February 12, 2013

Pre-Filed Direct Testimony in re: Application of Southwestern Public Service Company to Amend a Certificate of Convenience and Necessity for a Proposed Transmission Line within Hale, Floyd, Motley, Cottle, Briscoe, Hall, Childress, Donley, Collingsworth, and Wheeler Counties, Texas prepared for the Law Firm of Zach Brady & Co. on behalf of the Cogdell Trust (SOAH Docket No. 473-11-5978, PUC Docket No. 38877, Public Utility Commission of Texas) September 23, 2011.

Lea County, New Mexico Voluntary Remediation Program Application and Supporting Ground Water Documentation, submitted to the New Mexico Environment Department (“NMED”) May, 2011. Covenant Not to Sue issued by NMED September, 2011.

Pre-Filed Direct Testimony in re: Wind Energy Transmission Texas, LLC Proposed Long Draw to Sand Bluff, Sand Bluff to Divide, and Sand Bluff to Bearkat 345 kV CREZ Transmission Lines in Borden, Coke, Glasscock, Howard, Mitchell, & Sterling Counties, Texas prepared for the Law Firm of Stubbeman, McRae, Sealy, Laughlin & Browder on behalf of John B. Phillips, Skipper Driver, and Dane Driver (SOAH Docket No. 473-43-1266, PUC Docket No. 38825), January, 2011.

Pre-Filed Direct Testimony in re: ONCOR Willow Creek-Hicks 345-kV CCN for a CREZ Transmission Line in Denton, Parker, Tarrant and Wise Counties, prepared for the Law Firm of Herrera & Boyle on behalf of Group of Allied Land Owners (SOAH Docket No.473-10-4789, PUC Docket No. 38324), August 2010.

Pre-Filed Direct and Cross Rebuttal Testimony in re: Lone Star Central A to Central B to Sam Switch to Navarro CCN and Route Analysis, prepared for the Law Firm of Herrera & Boyle on behalf of the Ioni Creek Conservation Group (SOAH Docket No. 473-10-4398, PUC Docket No. 38230), August 2010.

Pre-Filed Direct Testimony in re: ONCOR Riley-Krum 345-kV CCN Route Study and Environmental Assessment, prepared for the Law Firm of Herrera & Boyle on behalf of the Clear Creek Preservation Coalition (SOAH Docket No. 473-10-4109, PUC Docket No. 38140), June 2010.

Pre-Filed Direct and Cross Rebuttal Testimony in re: LCRA CCN for a proposed 345-kV Transmission Line from Gillespie to Newton prepared for the Law Firm of Locke, Lord, Bissel and Lydell on behalf of CJ Ranch, Garrett Ranch, Point Peak resort and Jean Mueller (PUC Docket No. 37448), March 2010. ALJ’s adopted findings in my testimony to require the Utility to abandon their preferred route and use the alternative described in my testimony.

“Site Suitability Analysis for proposed Big Bear Oil and Gas Waste Disposal Facility (Section 32, T17S, R31E, NMPM, Eddy County New Mexico,” prepared for Big Bear, Inc., Lovington, New Mexico, December 2009.

“High Desert Site Suitability Analysis for a Sub-Title D Disposal Facility-Otero County, New Mexico,” prepared for WCI, Inc., Folsom, California, December 2008.

“Site Selection/Suitability Analysis for Proposed DOE Global Nuclear Energy Partnership (GNEP) Consolidated Fuel Reprocessing Facility and an Advanced Burner Reactor,” prepared for AREVA, Washington Group International and the Eddy-Lea Energy Alliance, December 2007.

“Volume IV: Siting and Land Use” IN THE MATTER OF THE APPLICATION OF CAMINO REAL ENVIRONMENTAL, INC. FOR A SOLID WASTE FACILITY PERMIT FOR THE CAMINO REAL LANDFILL, prepared for WCI, Inc. Folsom, California, March 2006.

“Rhino Landfill Status: Comprehensive Report to Otero County Commissioners,” presented on behalf of WCI, Inc., Folsom, California, November 2, 2005.

“Summary and Evaluation of New Mexico Oil Conservation Division Process and Procedure Under OCD Rule 711(B) In Re: Proposed Permits for Solid Waste Disposal for Artesia Aeration and Gandy Marley, Inc., prepared for CRI, Inc. Hobbs, New Mexico, June, 2005.

“Proposed Findings of Fact” In Re: THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING THE APPLICATION OF GANDY MARLEY, INC. TO MODIFY NMOCD PERMIT NO.NM- 01-019... Case No. 13,480, prepared for CRI, Inc. Hobbs, New Mexico, submitted to OCD June 24, 2005.

In Re: APPLICATION OF LCRA TRANSMISSION SERVICES CORPORATION TO AMEND ITS CERTIFICATE OF CONVENIENCE AND NECESSITY FOR A 138KV TRANSMISSION LINE IN KENDALL AND BEXAR COUNTIES: SOAH DOCKET NO. 473-04-7609; P.U.C. DOCKET NO. 29684, Expert Testimony presented in HEARING ON THE PROPOSED ALTERNATIVE FOR THE HILL COUNTRY PROJECT, June 27- July 2, 2005.

In Re: APPLICATIONS OF SANDOVAL COUNTY TO EXTEND AND MODIFY SOLID WASTE PERMITS FOR THE SANDOVAL COUNTY REGIONAL LANDFILL BEFORE THE NEW MEXICO ENVIRONMENT DEPARTMENT, Expert Testimony presented on Land Use and Site Suitability Criteria presented on May 11, 2005. (Permits Granted by NMED on June 17, 2005).

In Re: APPLICATION OF LCRA TRANSMISSION SERVICES CORPORATION TO AMEND ITS CERTIFICATE OF CONVENIENCE AND NECESSITY FOR A 138KV TRANSMISSION LINE IN KENDALL AND BEXAR COUNTIES: SOAH DOCKET NO. 473-04-7609; PUC DOCKET NO. 29684, Expert Testimony pre-filed on December 8, 2004, Austin, Texas.

In Re: APPLICATION OF LCRA TRANSMISSION SERVICES CORPORATION TO AMEND ITS CERTIFICATE OF CONVENIENCE AND NECESSITY FOR A 138KV TRANSMISSION LINE IN KENDALL AND BEXAR COUNTIES: SOAH DOCKET NO.473-04-7609; PUC DOCKET NO. 29684, Expert Testimony presented in HEARING ON ADEQUACY OF ROUTES, November 10, 2004, Austin, Texas.

“Siting and Land Use; Volume IV, Sandoval County Landfill Application,” prepared for Sandoval County, New Mexico under contract to Gordon Environmental, Albuquerque, New Mexico, July, 2004.

“Regulatory Impact Assessment for Proposed Amendments to Rule 711 (Groundwater Withdrawals), Subchapters E (Groundwater Withdrawal Permits), F (Standard Groundwater Withdrawal Conditions), G (Groundwater Available for Permitting; Proportional Adjustment; Equal Percentage Reduction), L (Transfers), and M (Meters; Alternative Measuring Methods; and Reporting): Rule 715 (Comprehensive Water Management Plan Implementation), Subchapters A (Definitions) and D (Demand Management and Critical Period Management Rules): Rule 702 (General Definitions): Rule 709 (Fees), Subchapter D (Aquifer Management Fees)” prepared for the Edwards Aquifer Authority under contract to Hicks and Co./ Kemp Smith, P.C., San Antonio, Texas, July 2004.

“New Mexico Environment Department: Transition Task Force—Follow-Up Analysis of NMED Issues Raised in December 2002 Transition Team Report” prepared for the New Mexico Governor’s Office, Santa Fe, New Mexico, December 9, 2003.

“Regulatory Impact Assessment for Proposed Rules Chapter 711 (Groundwater Withdrawal Permits) Subchapters E (Groundwater Withdrawal Permits), G (Groundwater Available for Permitting; Proportional Adjustment; Equal Percentage Reduction) and K (Additional Groundwater Supplies)” prepared for the Edwards Aquifer Authority under contract to Hicks & Co./ Kemp Smith, P.C., San Antonio, Texas, November 2003.

“Draft Surface Resource Protection Guidelines for Oil and Gas Operations on New Mexico State Trust Lands” prepared for the New Mexico State Land Office, Santa Fe, New Mexico, October, 2003.

“Regulatory Impact Assessment for Proposed Rules Chapter 715 (Comprehensive Water Management Plan Implementation Rules) Subchapters A (Definitions), B (Variance Procedures) and C (Groundwater Conservation and Reuse Rules) prepared for the Edwards Aquifer Authority under contract to Hicks & Co./ Kemp Smith, P.C., Austin, San Antonio, and El Paso, Texas, July, 2003.

“New Mexico Environment Department: Transition Task Force Report” prepared for the Hon. Bill Richardson, Governor-Elect, State of New Mexico, Santa Fe, New Mexico, December, 2002.

“Regulatory Impact Assessment for Proposed Rule Chapter 711 (Groundwater Withdrawal Permits) Subchapter J (Aquifer Recharge, Storage and Recovery Projects) prepared for the Edwards Aquifer Authority under contract to Hicks & Co./Kemp Smith, P.C., San Antonio, Texas, September, 2002.

“Regulatory Impact Assessment of Alternative Proposed Rule 715 (Comprehensive Water Management Plan Implementation Rules) Subchapter A (Definitions) and D (Demand Management and Critical Period Management Rules) [15 Percent Reduction in Stage IV Critical Period Management Groundwater Withdrawals] prepared for the Edwards Aquifer Authority under contract to Hicks & Co./Kemp Smith, P.C., San Antonio, Texas, September, 2002.

“Regulatory Impact Assessment for Proposed Rule Chapter 713 (Water Quality) Subchapters A (Definitions), B (General Provisions), C (Well Construction, Operation and Maintenance) and D

(Abandoned Wells; Well Closures) prepared for the Edwards Aquifer Authority under contract to Hicks & Co./Kemp Smith, P.C., San Antonio, Texas, August, 2002.

“Regulatory Impact Assessment for Proposed Rule Chapter 715 (Comprehensive Water Management Plan Implementation Rules) Subchapters A (Definitions) and D (Demand Management and Critical Period Management Rules) prepared for the Edwards Aquifer Authority under contract to Hicks & Co./Kemp Smith, P.C., San Antonio, Texas, July, 2002.

“Regulatory Impact Assessment for Proposed Rule Chapter 713 Water Quality; Subchapter A (Definitions) and Subchapter G (Recharge Zone Protection—Phase I Regulated Substance Tank Rules)” prepared for The Edwards Aquifer Authority under contract to Hicks & Co./Kemp Smith, P.C., San Antonio, Texas, June 2002.

“Disposal of Non-Weapons Materials: GTCC Privatization Efforts.” Prepared for Aquila, Inc., July 2001.

“Revised Cost Estimates for Remediation of Contaminated Sites on Cantrell et al. Properties in Johnson and Lawrence Counties, Kentucky (Martha Oilfield)” prepared for the Chandler Law Offices and Spivey-Ainsworth Law Firm, July 5, 2000.

“Final Site Assessment and [14 Day Report] for Maloof Holdings at 100 Industrial Avenue, Albuquerque, N.M.”, prepared for Raymond G. Sanchez and Robert Desiderio. Submitted to the New Mexico Environment Department, UST Bureau, May 19, 2000.

“Disposition of Pre-Subtitle D Landfills”, presented at the SWANA Arid Landfill Symposium, Albuquerque, New Mexico, April 12, 2000.

“Preliminary Cost Estimates for Remediation of Contaminated Sites on Cantrell et al. Properties in Johnson and Lawrence Counties, Kentucky (Martha Oilfield)”, prepared for the Chandler Law Offices and Spivey-Ainsworth Law Firm, May 25, 1999.

In Re: APPLICATION FOR SOLID WASTE PERMIT FOR LEA COUNTY REGIONAL LANDFILL BEFORE THE NEW MEXICO ENVIRONMENT DEPARTMENT, Presented Expert Testimony on Land Use and Site Suitability Criteria, Eunice, New Mexico October 15, 2005.

“Permit Application for Lea County Solid Waste Authority Regional Landfill”, prepared for Lea County Solid Waste Authority, Lea County , New Mexico, submitted to Solid Waste Bureau, New Mexico Environment Department (NMED), January, 1998 (Permit granted December, 1998).

“Evaluation of Proposed Longo Construction, Inc. Sludge Application Project (27,000 acres) in southern Hudspeth County, Texas”, prepared for Harlan Richey, March 1, 1998.

In Re: APPLICATION FOR SOLID WASTE RECYCLING AND DISPOSAL PERMIT FOR

CAMINO REAL ENVIRONMENTAL CENTER BEFORE THE NEW MEXICO ENVIRONMENT DEPARTMENT, Presented Expert Testimony on Land Use, Socioeconomics, Demographics, Epidemiological Statistics and Site Suitability Criteria, Sunland Park, New Mexico, June 15, 1997.

"Permit Application for Camino Real Environmental Center Regional Landfill and Recycling Center, (Sunland Park, New Mexico), prepared for RRI, Inc., El Paso, Texas, submitted to Solid Waste Bureau, New Mexico Environment Department (NMED), Nov. 1996. (Permit granted August 1997).

"Changing Patterns in Regulatory Frameworks for Incinerator Technology", presented to National Solid Waste Management Association - Colorado/New Mexico Annual Meeting, Telluride, Colorado, October 11 - 12, 1996.

"Regulation of Incinerator Technology in New Mexico" (joint presentation with New Mexico Environment Department) presented to Interim Committee on Radioactive and Hazardous Waste - New Mexico Legislature, Santa Fe, New Mexico, September 12, 1996.

"Environmental Justice and Landfill Siting in New Mexico", with Hicks & Co. co-author -contract research for C.R.E.C., August, 1996.

"Las Azaleas Constructed Wetlands - Environmental Assessment", prepared for El Paso County, Texas Lower Valley Water District Authority. Submitted to Texas Water Development Board, August, 1994.

"U. S. Bureau of Reclamation as Regional Water Manager - Rio Grande Project", written testimony presented to Senate Sub Committee on Natural Resources (Senator Bill Bradley, Chair) U.S. Senate, Washington, D.C., May, 1994.

"Plainview Independent School District (Hale County, Texas) Redistricting Submission", Prepared for Plainview ISD, Board of Trustees, Submitted to U.S. Department of Justice, Voting Rights Section, August 1993. Pre-clearance Granted.

"Permit Application for Carlsbad/Eddy County, New Mexico Regional Landfill", prepared for Carlsbad/Eddy County, submitted to Solid Waste Bureau, New Mexico Environment Department (NMED), July 9, 1993. (Permit granted 1994).

Nu-Mex Landfill Supplementary Data Report/Documentation of Compliance, Submitted to U.S. Environmental Protection Agency Region 6, Prepared for JOAB, Inc., Sunland Park, New Mexico, May 28, 1993.

"Final Permit Application for Regulated Medical Waste Processing Facility - Albuquerque, New Mexico", prepared for Med Compliance Services, Inc., Submitted to the Solid Waste Bureau, NMED, May 1, 1993. Permit granted January 1994.

"Brownfield Independent School District (Terry County, Texas) Redistricting Submission", Prepared for Brownfield ISD Board of Trustees, Submitted to U.S. Department of Justice, Voting Rights Section, January 1993. Pre-clearance Granted.

"Floydada Independent School District (Floyd County, Texas) Redistricting Submission", Prepared for Floydada ISD Board of Trustees, Submitted to U.S. Department of Justice, Voting Rights Section, December 1992. Pre-clearance Granted.

"Preliminary Site Selection/Site Characterization of Proposed Carlsbad/Eddy County, New Mexico Regional Landfill", Prepared for City of Carlsbad/Eddy County, New Mexico, Submitted to Solid Waste Bureau, NMED, August 10, 1992.

"Draft Permit Application for Bio-Medical Waste Processing Facility - Albuquerque, New Mexico", prepared for Med. Compliance Services, Inc., Submitted to the Solid Waste Bureau, NMED, July 15, 1992.

"Documentation in Support of a Bio-Medical Waste Transfer Facility, Las Cruces, New Mexico", Prepared for Med. Compliance Services, Inc., Submitted to NMED and City of Las Cruces, July 1, 1992.

"Transportation Contingency Plan for Bio-Medical Waste Services", Prepared for Med. Compliance Services, Inc., Submitted to the Solid Waste Bureau, NMED, June 15, 1992.

"Documentation in Support of a Proposal to Provide Bio-Medical Waste Services to the New Mexico Hospital Association", Prepared for Med. Compliance Services, Inc., Submitted to Hospital Services Corporation, May 15, 1992.

"Alternative Redistricting Plans for the City of Brownfield, Texas - City Council Precincts", Prepared for the City of Brownfield, Texas, May 15, 1992. Pre-clearance Granted.

"Alternative Redistricting Plans for the Post Independent School District - School Board Trustee Districts", Prepared for the Post Independent School District (Garza County, Texas), June 30, 1992. Pre-clearance Granted.

"Land Use Analysis of Proposed Sunland Park Annexation of Santa Teresa Commercial District" - Expert Testimony Before the New Mexico Boundary Commission, January 25, 26, 1992 for Santa Teresa Community Development, Inc.

"Border Environmental Issues", Prepared Testimony Delivered to the New Mexico Secretaries of Environment and Economic Development on Potential Border Crossings at Santa Teresa and Sunland Park, New Mexico, Las Cruces, New Mexico, January 14, 1992.

"Terry County Commissioner's Precinct Redistricting Submission", Prepared for Terry County, Texas, Submitted to U.S. Department of Justice, Voting Rights Section, January, 1992. Pre-clearance

Granted.

"Environmental Assessment of Proposed Leviton Site", (Airport Business Park at Santa Teresa, New Mexico), prepared for C. L. Crowder Investment Company, Santa Teresa, New Mexico, September 19, 1991.

"Proposal to Replace MCS Incinerator" (to NMED), Prepared for Med. Compliance, Inc., El Paso, Texas, December, 1991.

"Prepared Testimony on Impacts of Buffer Zones in NMED Proposed Solid Waste Rules", Delivered to New Mexico Environmental Improvement Board - Roswell Hearings, November, 1991.

"Special Use Permit Application for Bio-Medical Waste Processing Facility", submitted to Doña Ana County for Med. Compliance, Inc., El Paso, Texas, September 16, 1991.

Summary of Findings for Nu-Mex Landfill Application Hearing, ("New Mexico Environment Department"), Prepared for JOAB, Inc./Med. Compliance, Inc., El Paso, Texas, August, 1991.

"Compliance Schedule for Bio-Medical Incinerator Pursuant to New Mexico Environment Department Air Quality Control Regulation 2020", Prepared for Med. Compliance, Inc., El Paso, Texas, August 1, 1991.

"Air Quality Permit Application for Proposed Microwave Bio-Medical Waste Processing Facility", Submitted to NMED (Air Quality Control Bureau) for Med. Compliance, Inc. El Paso, Texas, August 1991.

"Who Needs an Assessment?" Presented at National Association of Engineering Geologists Annual Meeting, Chicago, Illinois, October 4, 1991.

"Environmental Assessment of Proposed Belen-Rio Grande Railroad Bridge", prepared for Southern Pacific Transportation Company, San Francisco, California, August, 1991.

"Environmental Assessment of Proposed Sparks Water Delivery System", prepared for El Paso County Lower Valley Water District, El Paso, Texas, June, 1991.

"Environmental Assessment (Socioeconomics and Land Use Issues) for Proposed Brownsville Channel Dam", Prepared for Brownsville Water Authority under contract to Horizon Environmental, Brownsville, Texas, February, 1991.

"Environmental Information Documents for Santa Teresa International Project", Prepared for Charles Crowder, Santa Teresa, New Mexico, August, 1990.

"Status Report and Proposed Action -- Fabens Landfill", Prepared for El Paso County

Commissioner's Court, El Paso, Texas, March 14, 1990.

"Environmental Assessment of Proposed El Paso County River Park", Prepared for El Paso County, Submitted to Texas Parks and Wildlife Department, January 31, 1990.

"Muleshoe Independent School District Redistricting Submission", Prepared for MISD, Submitted to U.S. Department of Justice Voting Rights Section, January, 1990. Pre-clearance Granted.

"An Evaluation of Alternatives for Providing Water Infrastructure to Unplanned Sub Divisions", Prepared for Presentation at the Conference on Sanitation Problems in the Colonias Sponsored by the Institute of Regional Studies, San Diego State University, October 25, 1989, El Paso, Texas.

"Groundwater Discharge Plan/Extension: Mesquite Site, Doña Ana County, New Mexico", Prepared for Doña Ana County Commissioners, Las Cruces, New Mexico, Submitted to NMED, Santa Fe, New Mexico, August, 1989.

"Testimony Before Special Committee of New Mexico Legislature on Solid Waste Management Problems - Site Selection Criteria on Federal Land", Las Cruces, New Mexico, June, 1989.

"Documentation in Support of Detachment/Annexation of Section 40 from CISC to AISD - Land Use and Socioeconomic Considerations", Prepared for Robert Garrett, Coldwell Banker/Terra Finis, Amarillo, Texas, February, 1989.

"Report of the Special Committee on El Paso City/County Consolidation", Prepared for the El Paso County Commissioner's Court and El Paso City Council, January, 1989.

Written Statement Submitted at Technical Hearings Before the New Mexico Environmental Improvement Division Regarding Proposed New Mexico Solid Waste Management Regulations, Santa Fe, New Mexico, November 17, 1988.

"Mapping Alternatives for Intergovernmental Cooperation in an Environment Characterized by Intergovernmental Conflict", Prepared for Presentation at the American Society for Public Administration, Region VII Conference, El Paso, Texas, November 4, 1988.

"Environmental Information Document (EID) for Water Delivery Plans for the El Paso Lower Valley (Colonias)", Prepared for the El Paso County Lower Valley Water District Authority (1988) for Submission to U.S. Bureau of Reclamation. (EID Approved by Bureau of Reclamation November 4, 1988).

"Fiscal and Land Use Impact Assessment of Lubbock-Cooper Independent School District Boundary Modification", Prepared for Lubbock-Cooper ISD (Texas), June, 1988.

"Preliminary Market Analysis for General Dynamics/El Paso Sand Facility", Prepared for El Paso

Sand, Inc., El Paso, Texas, 1988.

"Comparative Land Use Analysis: Santa Teresa, New Mexico, (2400 Acres)", Prepared for Wilson & McIlvaine, Chicago, Illinois, 1988.

"Site Suitability Study for Superconducting Magnetic Energy Storage System - ETM", Prepared for El Paso Electric Company, El Paso, Texas, 1988.

"Waste Management Plan for Doña Ana County, New Mexico", prepared for Doña Ana County Commissioners, Las Cruces, New Mexico, 1988.

"Groundwater Discharge Plan: Mesquite Landfill Site, Doña Ana County, New Mexico", Prepared for Doña Any County Commissioners, Las Cruces, New Mexico, Submitted to New Mexico Environmental Improvement Division, Santa Fe, New Mexico, 1988.

"Evaluation of Mesa Verde Apartment Project Proposal", Prepared for Paul Lyle & Associates, Plainview, Texas, 1988.

"Southern New Mexico Superconducting Super Collider Site Proposal", DOE Submission, September 1987.

"Far West Texas (Hudspeth County), Superconducting Super Collider Site Proposal", DOE Submission, September, 1987.

"Redistricting Submission (Single Member Election Precincts), Floydada Independent School District", U.S. Department of Justice, Voting Rights Section, 1987. Pre-clearance Granted,

"Preliminary Feasibility Report on Land Use Alternatives - ASARCO El Paso Property", Prepared for Nebyn Peterson & Associates, Houston, Texas, 1986.

"Comprehensive Evaluation of Infrastructure: Sunland Park/Santa Teresa, New Mexico", Prepared for Santa Teresa Associates, Santa Teresa, New Mexico, 1986.

"Preliminary Feasibility Analysis of Land Use Alternatives - Hueco Ranch (50,000 Acre Parcel)", Prepared for R.O. Anderson, Diamond A Cattle Company, Roswell, New Mexico, 1986.

"Feasibility Analysis of Knapp Properties Development - Franklin Mountain Parcels", Prepared for Texas State Attorney General; provided expert land use testimony- In Re: Knapp vs State of Texas (Parks and Wildlife Department), 1986.

"Highway Diversion Channel Modification Study", Prepared for Duke, Inc., Submitted to Army Corps of Engineers, Ft. Worth, Texas, March, 1986.

"Population Projection Update, South Texas Nuclear Power Plant (STP, ER-OL)", Prepared for Houston Light & Power, EH & A Document 1985.

"Montecello-Winfield Mine Area Cultural Resources Model", Prepared for TUMCO, EH & A document, 1985.

"Possum Kingdom Inn and Country Club Feasibility Study", Prepared for Leo Appleby, Mineral Wells, Texas, EH & A Document, 1985.

"Environmental Assessment of Osuna Road Extension", Prepared for City of Albuquerque, EH & A document, 1985.

"Environmental Assessment of Infrastructure Extension on Sandia Pueblo", Prepared for Bureau of Indian Affairs, EH & A Document, 1985.

"Existing Environment of the Region of Interest for LCRA's Proposed Deenville Project (Land Use and Socioeconomics)", Prepared for Lower Colorado River Authority, EH & A Document, 1985.

"Final Report on Pre-Construction Monitoring of Brown Pelican and Migratory Waterfowl Movements Near CP & L's Proposed Laguna Madre Transmission Line", Prepared for Central Power & Light, EH & A Document, 1985.

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